WBS 1.1.4 Installation Issues Summary
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WBS 1.1.4 installation has overlaps with WBS 1.1.2 (Neutrino Beam Devices), WBS 1.1.7 (Water, Vacuum & Gas Systems & Integration), and WBS 2.5 (Near Detector Installation). This document is an abbreviated discussion of WBS 1.1.4 installation and its overlaps with the other WBS elements.

In the first 22 working days after Beneficial Occupancy of the Target Hall the downstream end of the hall will be unencumbered by shielding. This is a time window during which the Decay Pipe cooling pipes can be cut and fitted with elbows (WBS 1.1.7), and the upstream end cap can be welded onto the end of the open decay pipe. During the same time window, work at the downstream end of the decay pipe should also proceed, with a goal of making a system test under vacuum and determining that there are no leaks of concern. If there are leaks and they can be determined to be at the ends, they can be easily fixed during this same time window. If there are significant leaks and they are internal to the decay pipe and its concrete shield, then there will be lots of discussion of how to proceed. Some of the options on how to proceed would probably delay installing the downstream shielding in the Target Hall. The presence of this shielding effectively rules out access to the upstream end of the decay pipe. Ancillary items for this time period would be extending the Decay Pipe cooling lines to a point outside the shielding that will get installed, and, similarly, running a stainless steel line from an instrumentation port connection on the upstream end of the decay pipe (assuming that we decide that vacuum instrumentation on the upstream end is worth having).

The work necessary at the downstream end of the decay pipe during this time window is the installation of the downstream end cap (i.e. welding it to the open decay pipe at that end) and connecting it to the vacuum pump. Prior to its installation the Decay Pipe cooling lines at the downstream end would have to be cut, fit with elbows, and have extensions of each to a point that is accessible outside of the shielding that will be installed. In addition, a shielding block base is necessary as a support for the downstream end of the end cap. After welding the end cap onto the open decay pipe additional shield blocks should be put into place before routing the connecting piping to the vacuum pump—since the connecting piping goes out through a hole in that shielding. This extra shielding could be removed after the connecting piping is welded onto the end cap, if access to the weld joint between the end cap and the decay pipe is needed to repair any leak found during system testing.

The vacuum pump would have to be installed (WBS 1.1.7). It would not need its full instrumentation and control package, since the system test would be closely monitored.

The installation equipment needed would be the Lazer forklift and a wheeled cart. The Mini-Jack crane would not be needed for this initial 22 working day period after Beneficial Occupancy. The wheeled cart would be used for awkward-sized loads, such

as the 84" long DS End Cap and the vacuum pump skid. It could be pushed up the 650' long, 10.8% grade ramp by the Lazer forklift.

After this initial 22 working day period the Near Detector installation effort would take over use of the Minos Shaft crane. Their installation efforts make heavy use of the crane for 6 months. In addition, they are not subject to Davis Bacon requirements for their installation (since it is like installation of any experiment) so they plan to use Fermilab technicians for operation of the crane and moving loads from the bottom of the shaft into the Minos Near Detector Cavern. Because installation of the Hadron Absorber is subject to Davis Bacon requirements, sharing the crane on a quite flexible basis is out of the question—in order to avoid labor grievances.

A plan with clean separation in time of crane use would be for the installation of the Hadron Absorber to wait 6 months for the Near Detector heavy crane use period to finish. Since the WBS 1.1.2 installation period is about 14 months long, this would leave a period of about 7 months for installation of the Hadron Absorber and its pre-commissioning.

A more convoluted installation plan for the Hadron Absorber would try to make use of the fact that the Near Detector installation could be arranged so that near detector planes are installed in groups. According to Cat James, installation of each group would have a period of time during which the shaft crane is in use while getting the group in place, but there could be a subsequent period of time where the crane wasn't in heavy use while the group was having its scintillator planes and readout electronics wired and checked out. Scheduling Near Detector crane usage in this fashion would only be beneficial to installation of the Hadron Absorber if there were periods of activity during that installation effort that didn't involve heavy use of the Minos shaft crane. One such activity would occur after the absorber core elements were in the Absorber Cavern and the core was being assembled. The assembly of the core requires welding the water lines to the aluminum modules & this could be scheduled to occur in a period of time that didn't require use of the Minos shaft crane. The same period of time could include the connection of the water lines to the valves and to the water manifold, as well as the routing of thermocouple wires (each module has a redundant set of thermocouples). It would also include doing a system test of the water system—to check that there aren't leaks present.